Overview of Bird Strike Hazards

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NTSB Public Hearing US Airways Flight 1549

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Bird strikes are an increasing safety and economic concern to the aviation industry

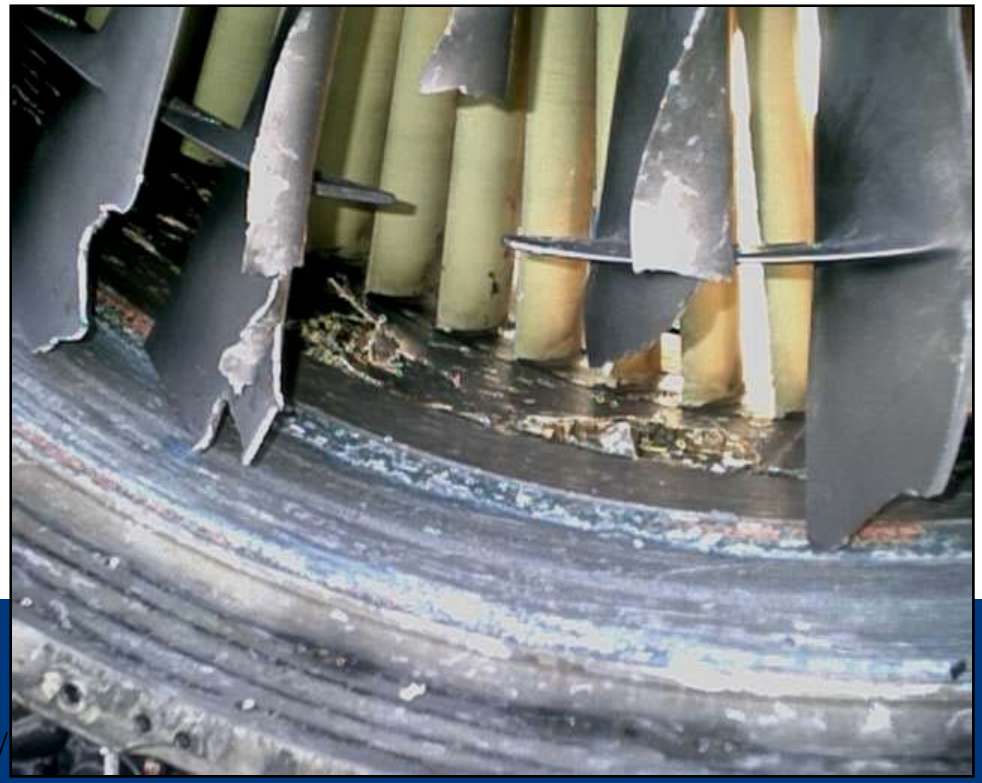
Costs:

*Air Carriers Worldwide > $ 1.2 billion/ year

*U.S. Civil Aviation > $ 0.6 billion/ year

*Human lives > 229 since 1988

Canada goose strike with A-300
Dayton, Ohio - July 2001
$3.5 million



USDA/

Population Status of the 14 Bird Species in N. America with Mean Body Masses >8 lbs (3.6 kg)

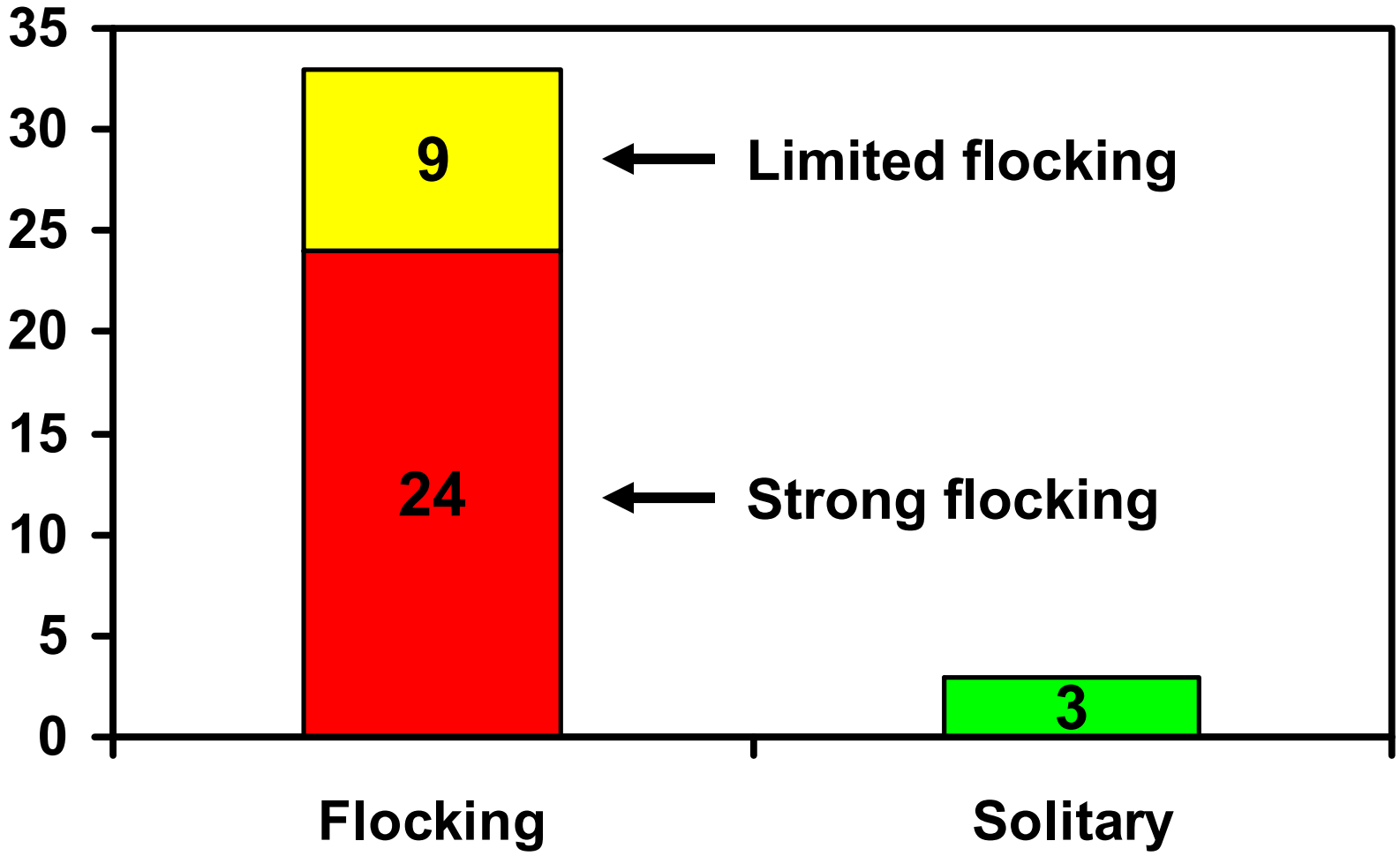
Rank	Species	Mass (lbs)	Population trend	Current population
1	Mute swan	26.0	Increase	>25,000
2	Trumpeter swan	25.1	Increase	40,000
3	California condor	22.3	Increase	180
4	Wild turkey	16.3	Increase	7,000,000
5	Tundra swan	15.7	Increase	163,000
6	Am. white pelican	15.4	Increase	>120,000
7	Whooping crane	12.8	Increase	393
8	Sandhill crane	12.8	Increase	>650,000
9	Yellow-billed loon	12.1	Unknown	~25,000
10	Bald eagle	11.8	Increase	>100,000
11	Golden eagle	10.8	Increase	?
12	Canada goose	9.2	Increase	5,900,000
13	Common loon	9.1	Increase	>500,000
14	Brown pelican	8.2	Increase	200,000

Wildlife Services

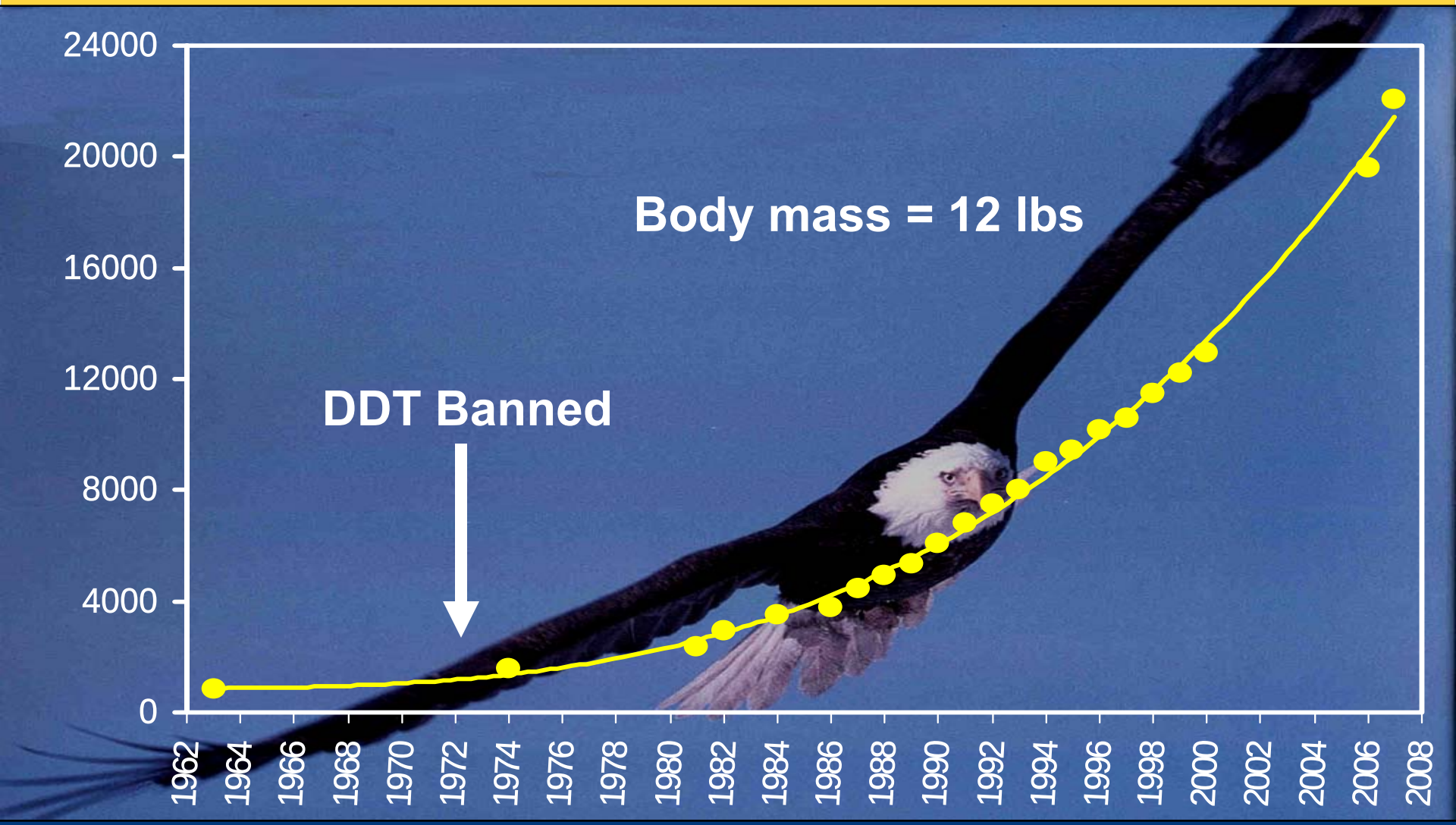
Population trends for all large (>4 lb) birds, USA

Body mass	No. of species	Species exhibiting: Pop. increase	Pop. decrease	Stability or unknown
All species 4-8 lbs	22	11	2	9
All species over 8 lbs	14	13	0	1
Grand total: all species over 4 lbs	36	24	2	10

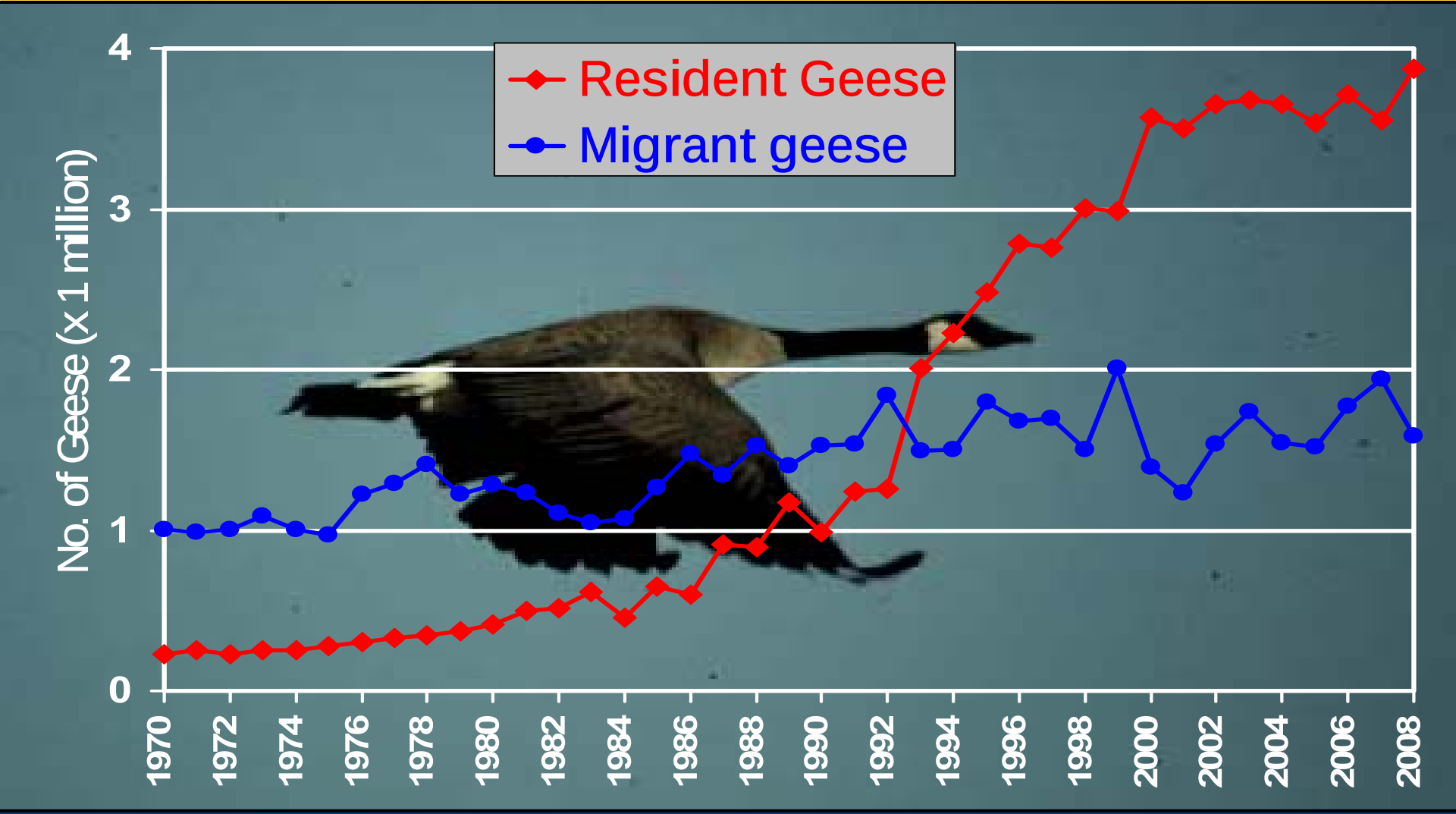
Flocking Status of the 36 Species of Large (> 4 lbs) Birds in North America



Example # 1 Nesting Bald Eagle Population increased > 20 fold in contiguous USA (1963-2007)



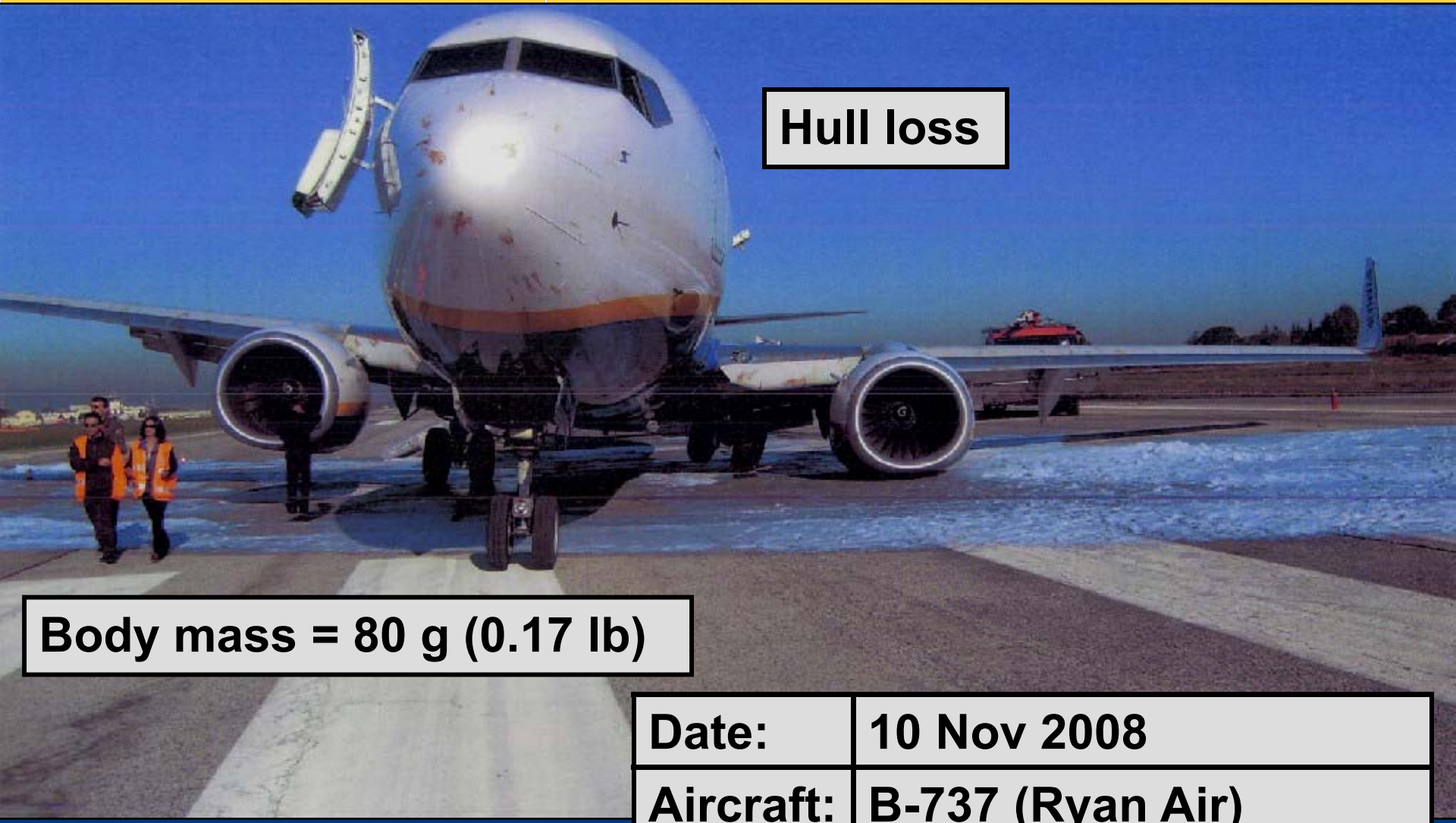
Example #2 Resident Canada Goose population in North America > from about 1 million in 1990 to 3.9 million in 2008



Summary of strike statistics for large birds Civil Aviation, USA

Body mass	No. of species in N. Amer.	No. of species w/ reported strike	Reported strikes (1990-2008)		
			Total	No. (%) with damage	No. (%) with >1 bird
All species 4-8 lbs	22	16	1,163	510 (49)	118 (10)
All species over 8 lbs	14	12	1,834	935 (50)	683 (37)
Grand total: all species over 4 lbs	36	28	2,997	1,445 (49)	801 (27)

B-737 Collision with European Starlings, Nov 2008



Hull loss

Body mass = 80 g (0.17 lb)

Date:	**10 Nov 2008**
Aircraft:	**B-737 (Ryan Air)**
Airport:	**Rome Ciampino airport**

2006: Airbus hits over 270 starlings at Dulles; birds in both engines

Date: 1 March 2006
Aircraft: Airbus 320
Location: Dulles International
Phase of flight: Final approach
Damage: #1 Engine removed for repair
Wildlife species: Over 270 European starlings removed from runway

May 25, 2008 B-747 Engine Ingestion of Eurasian kestrel during take-off run, Belgium

Eurasian Kestrel (0.4 lbs; 190 g)

Wildlife Services

Protecting People
Protecting Agriculture
Protecting Wildlife

USDA/Sandusky, OH

What phase of flight & height AGL pose the greatest risk for bird strikes?

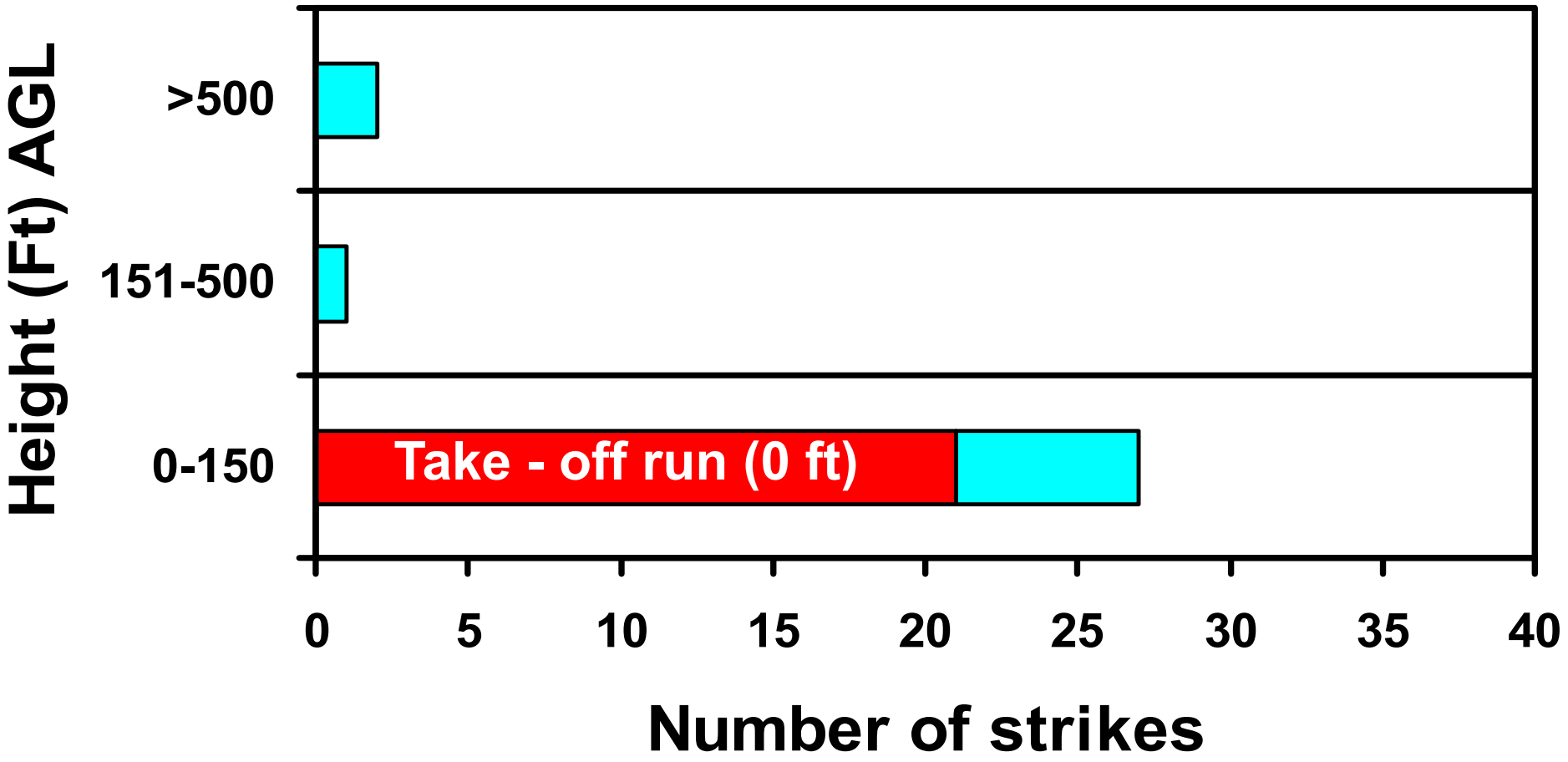
Summary of hull losses caused by bird strikes: Turbine-powered jet transport (>12,500 lbs) aircraft

Phase of flight	Turbofan	Turbojet	All jet turbine
Take-off run/ initial climb	20	8	28
En-route	1	0	1
Approach/ landing	1	0	1
Total	22	8	30

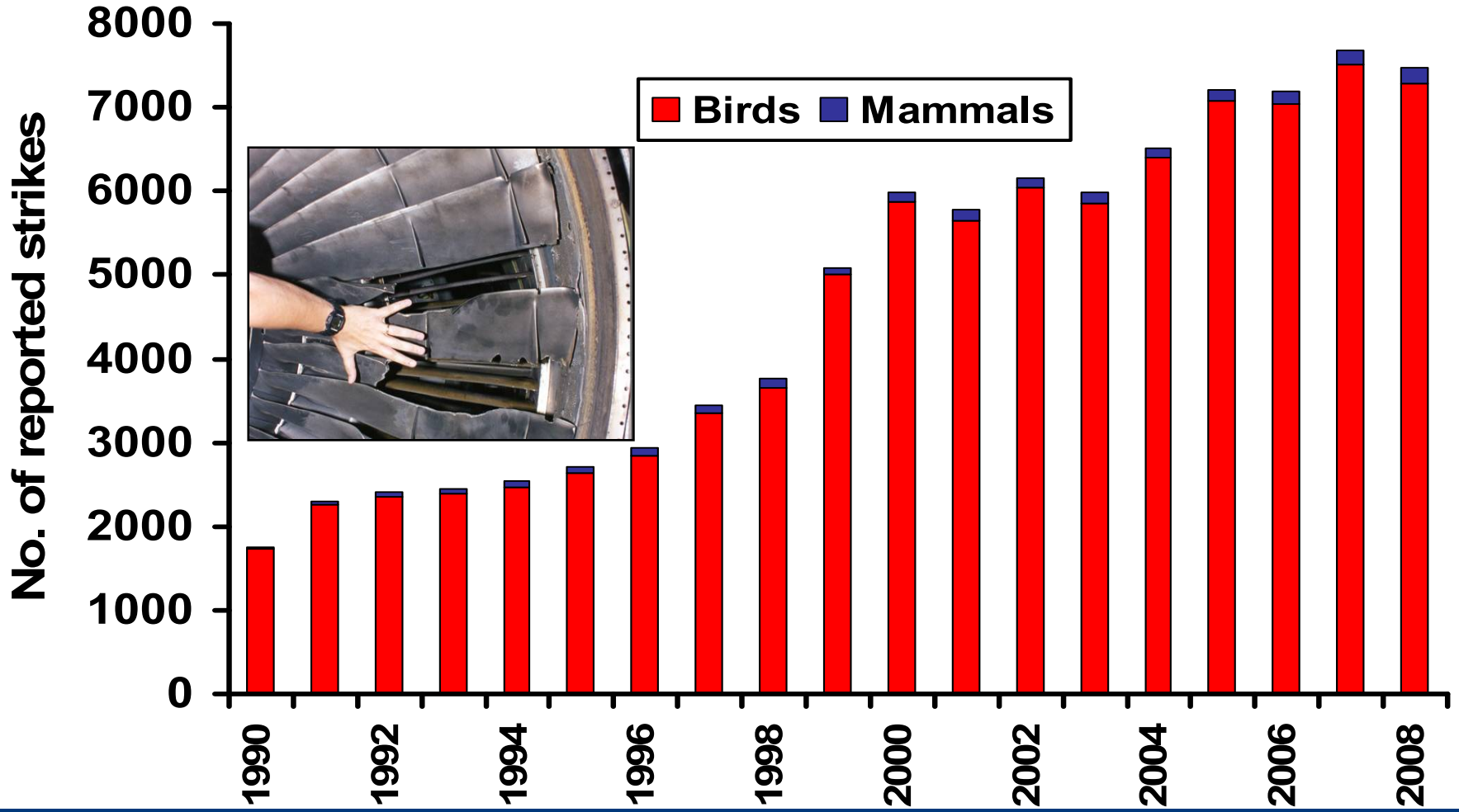
Wildlife Services

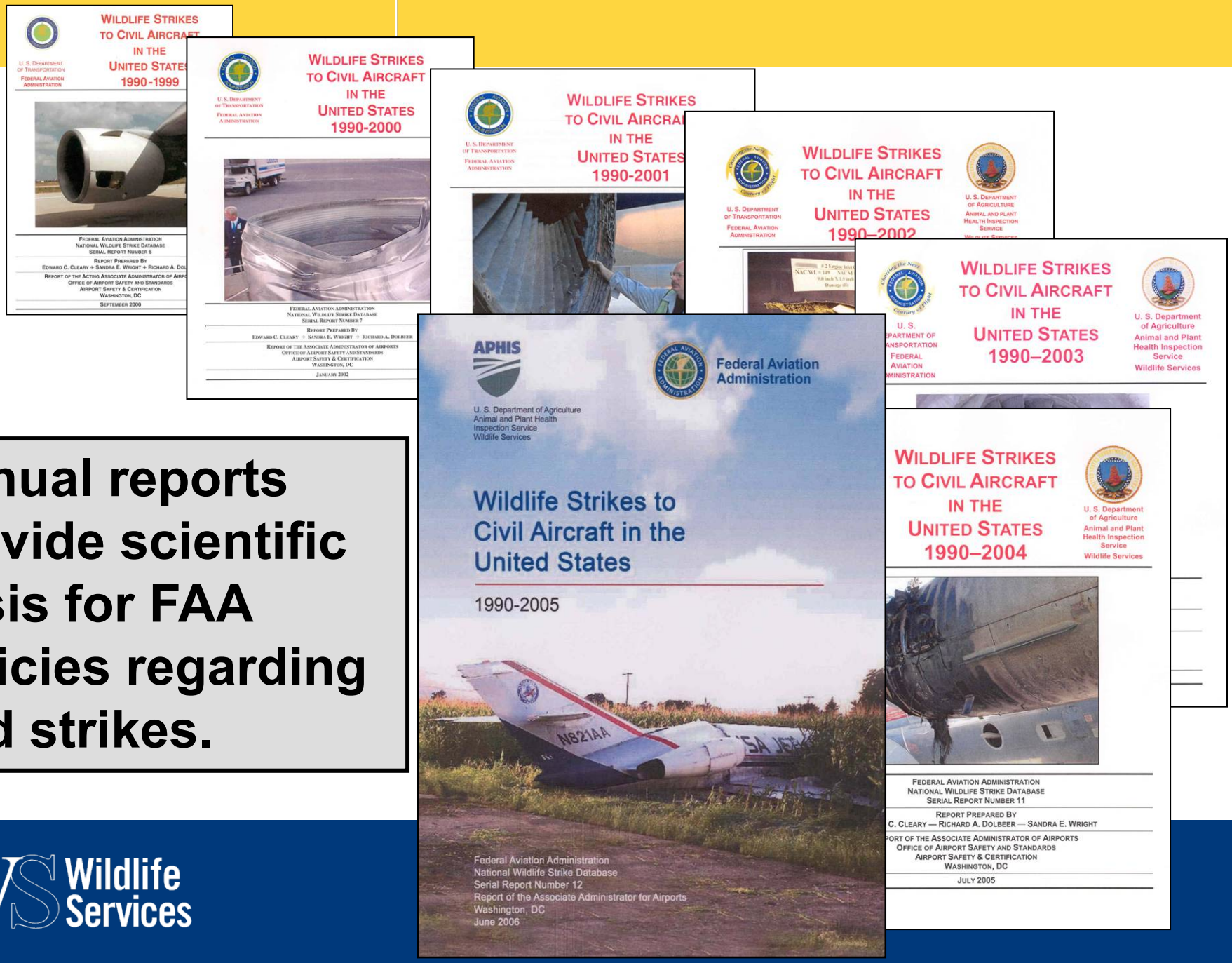
Number in Take-off or Initial Climb phase of flight = 28 of 30 (94%)

Height AGL at which bird strike occurred for turbine-powered jet aircraft with hull loss



National Wildlife Strike Database: Reported Strikes with Civil Aircraft in USA Tripled, 1990-2008 (N = ~90,000)





Annual reports provide scientific basis for FAA policies regarding bird strikes.

WS Wildlife Services

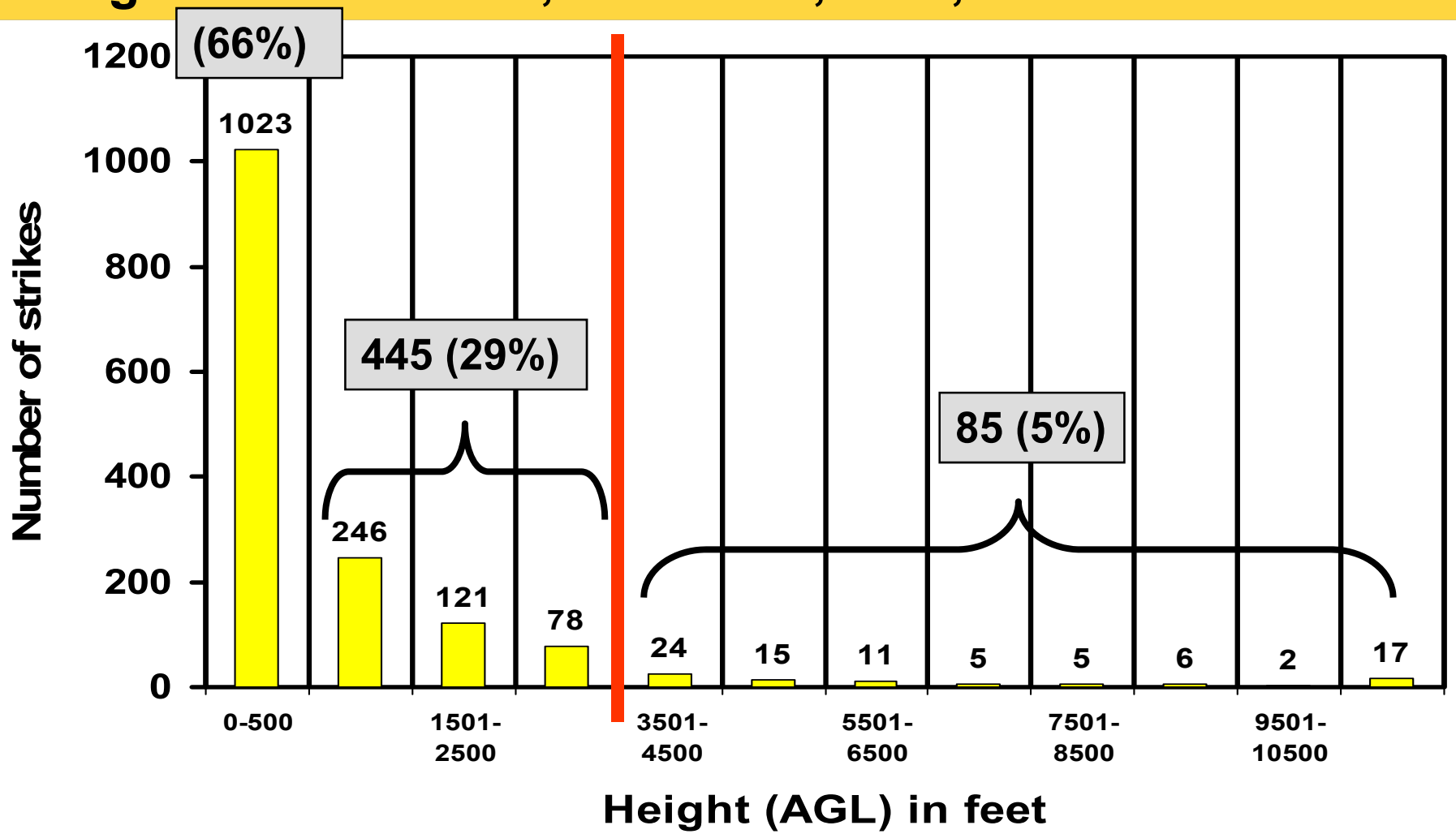
FAA National Wildlife Strike Database provides a National overview of the wildlife strike problem

Example

From 1990-2008, the number of turbine-powered civil aircraft with:

1 engine struck	2 engines struck	1 engine damaged	2 engines damaged	1 or more engines shut down
9,995	505	3,239	108	> 274

Only 5% of reported strikes w/civil aircraft causing substantial damage occurred at >3,500 ft AGL, USA, 1990-2004



Wildlife Services
Protecting People
Protecting Agriculture
Protecting Wildlife

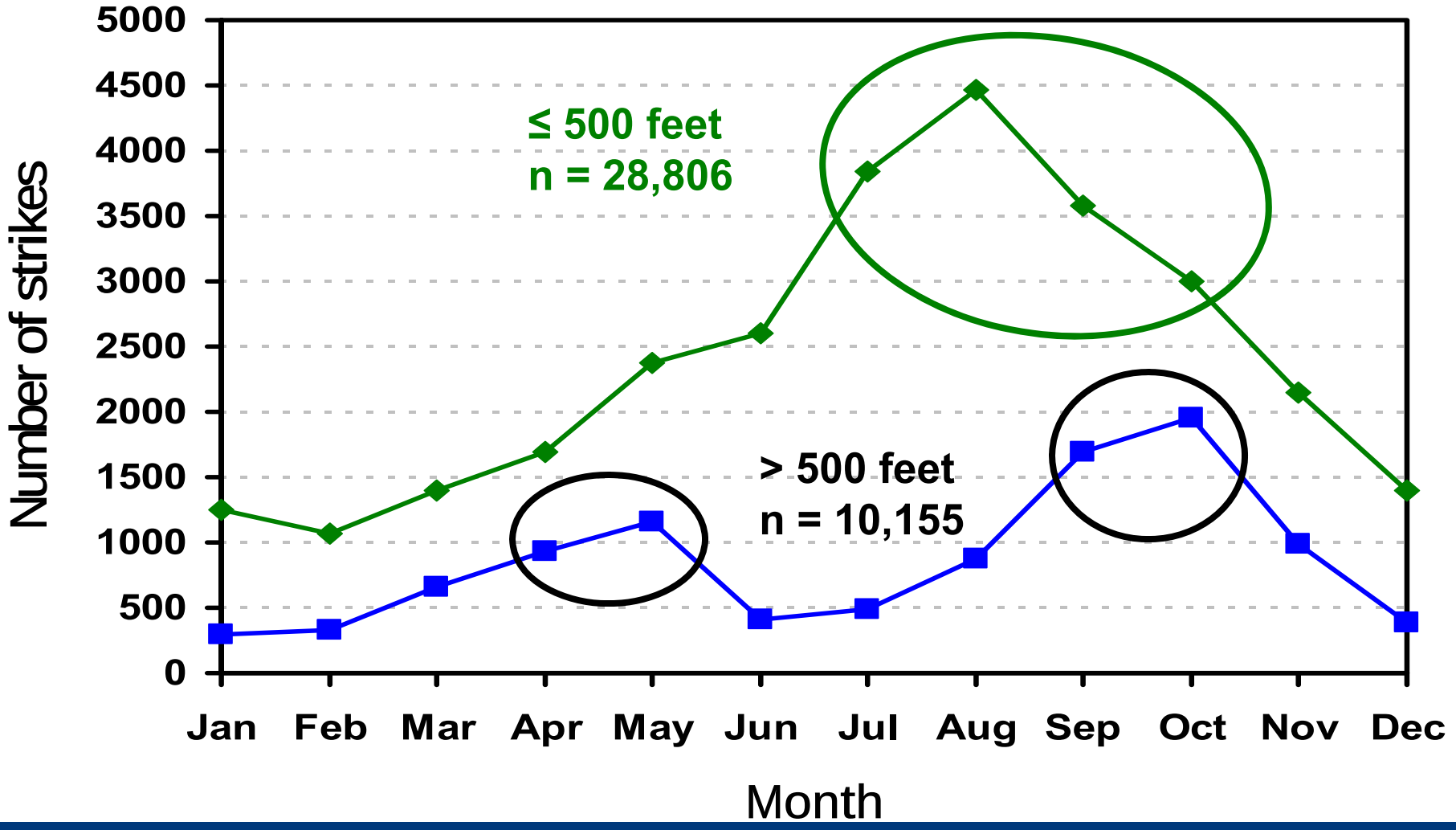
(N= 1,554 strikes)

Bird strikes: day vs. night?

At < 500 feet AGL, only 15.6% of bird strikes occur at night; However, only 17.7% of civil aircraft movements occur at night. Thus, strikes with civil aircraft per 10,000 movements below 500 feet are about equally likely to occur at night compared to day.

At > 500 feet AGL, 60.8% of bird strikes occur at night; However, only 17.7% of aircraft movements occur at night. Thus, strikes with civil aircraft per 10,000 movements at >500 feet are about 7 times more likely to occur at night compared to day.

Number of bird strikes above and below 500 feet AGL by month, Civil Aviation, USA, 1990-2004



Database deficiency #1:

Species Identification

79,972 birdstrikes (1990-2007)

34,304 identified at least to species group (44%)

20,974 were identified to species (26%)

90% are federally protected species under MBTA

Database deficiency #2:

Uneven reporting by airports & air carriers:

Airports that do not report all known strikes are at a disadvantage in developing Wildlife Hazard Management Plans under a Safety Management System (SMS)

You cannot manage a problem you have not adequately defined.

SMS requires data to assess risk

Mitigation considerations

1. **Reevaluate airworthiness standards.**
2. **Focus wildlife hazard mitigation efforts on airport.**
3. **Continue to evaluate bird-detecting radar systems.**
4. **Focus research on aircraft visibility & detectability by birds.**

USDA/Sandusky, OH

Solutions

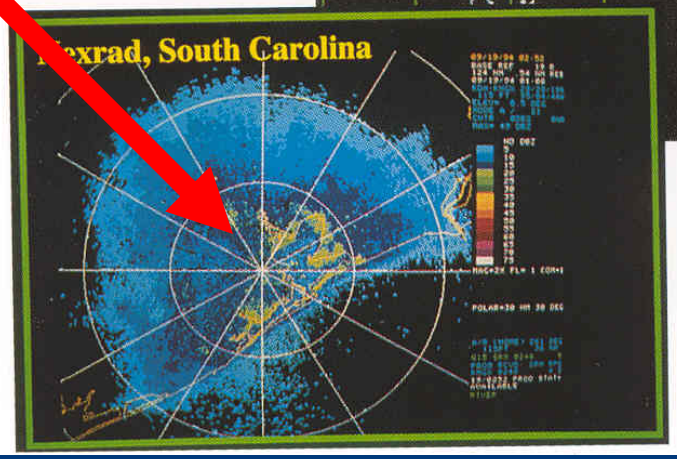
Focus wildlife hazard mitigation efforts on airport

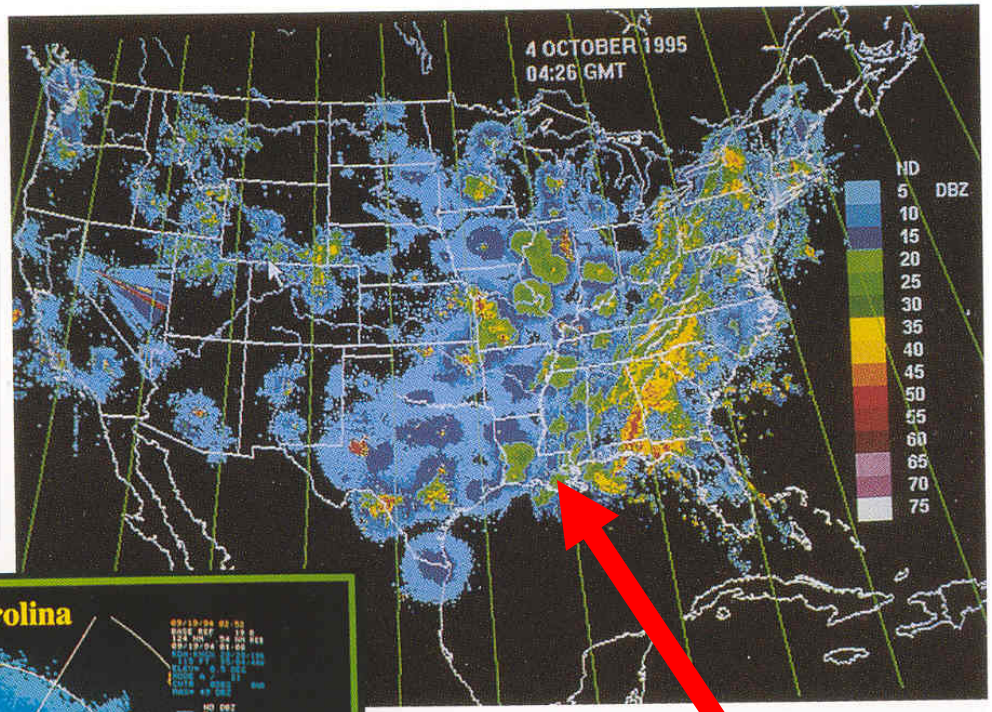
27 of 30 hull losses involving turbine-powered transport jet aircraft have occurred following strikes at < 150 ft AGL.

28 of 30 hull losses involving turbine-powered transport jet aircraft have occurred following strikes at < 500 ft AGL.

Continue to evaluate bird-detecting radar systems

NEXRAD radar showing bird migration across Gulf of Mexico at 22:00 on 29 Sept 1994





Combined images from 165 NEXRAD radar stations in USA showing bird migration at 04:26, 4 October 1995

Courtesy Dr. S. A. Gauthreaux Jr.

Focus research on aircraft visibility & detectability by birds